F. Sudweeks, H. Hrachovec and C. Ess (eds). Proceedings Cultural Attitudes Towards Communication and Technology 2008, Murdoch University, Australia, 617-631.

CULTURAL FACTORS IN WEB DESIGN

Multinational analysis

EWA CALLAHAN
Quinnipiac University
Hamden CT USA

Abstract. This study evaluates the similarities and differences in visual components of the design of websites around the world. The differences have been measured using Geert Hofstede's five dimensions of culture: power distance, individualism/collectivism, masculinity/femininity, uncertainty avoidance, and long/short time orientation. The data for this study consist of 900 university websites from 45 countries and regions around the world. Websites were compared, using content analysis methods on the basis of page layout, directionality, symmetry, as well as the presence of news and search engines. Pictures were analyzed by type and depiction category. The frequencies of visual site characteristics were correlated with Hofstede's indexes. Significant statistical correlations were found for power distance and individualism/collectivism, while the other dimensions yielded no significant results.

Résumé. Cette étude évalue les différences et les similarités des composants visuels de sites Internet du monde entier. La mesure des différences a été prise par le biais de l'utilisation des cinq dimensions de la culture qui ont été établies par Geert Hofstede : la distance hiérarchique, l'individualisme / altruisme, masculinité / féminité, le contrôlé de l'incertitude et l'orientation long / court terme. Les données collectées pour cette étude proviennent de 900 sites d'universités implantées dans 45 pays ou régions du monde. Les sites ont été comparés par le biais de méthodes d'analyse de contenu, qui prennent appui sur la disposition des pages web, la directionnalité, la symétrie, de même que sur la présence d'actualités et de moteurs de recherche. Les images ont été analysées par type et par catégorie de représentation. Les fréquences des caractéristiques visuelles de ces sites ont été mis en rapport avec les index d'Hofstede. Des rapprochements statistiques significatifs ont été trouvés pour les critères de distance hiérarchique et d'individualisme / altruisme, alors que pour les autres dimensions, résultat tangible n'a été démontré.

1. Introduction

Cultural differences and similarities have been extensively studied in anthropological and social research and have also become an important issue in international interface design. Several studies (ex. Barber & Badre 1998; Marcus & Gould, 2000) discuss

visual aesthetics of websites in a cultural context and try to assess the role of cultural markers on usability. As the Web made its transition from an information to a communication medium, permitting intercultural interactions on a global scale, the importance of understanding cultural factors in interface design gained more interest among researchers. While earlier studies (ex. Choong & Salvendy, 1998; Russo and Boor, 1993) concentrated mainly on the identification of cultural traits visible in interface design, more recent studies attempted to explain those differences by theory based studies (Ackerman 2002, Marcus & Gould 2000).

One theorist who gained particular popularity among visual communication researchers is a Dutch anthropologist Geert Hofstede. Hofstede researched 53 countries and regions around the globe and concluded that cultures differ on the basis of five bipolar dimensions that characterize social interactions: power distance, individualism vs. collectivism, masculinity vs. femininity, uncertainty avoidance and long vs. short term orientation (Hofstede, 2001). Furthermore each of the dimensions can be represented by statistical index. Power distance (PDI) relates to the ways cultures handle social inequities, especially in the boss-subordinate relations. In countries on the high end of the spectrum like Malaysia, Guatemala and Philippines, the interaction between superiors and subordinates will be much stricter than in low power distance countries like, for example, Scandinavian countries.

Individualism vs. collectivism dimension (IDV) describes the emphasis a particular society places on individual achievement as opposed to collective responsibility. In individualistic societies (ex. U.S., Australia), a person is expected to take care of him/herself and his or her immediate family, while in collectivist cultures (ex. Ecuador, Pakistan) s/he has obligations to a much more extended group based on family, social or work related ties.

While the first two dimensions seem to be rather straightforward, the remaining three require more detailed explanation. The third dimension masculinity/femininity (MAS) is commonly misunderstood, since it is frequently associated with male/female stereotypes. The name of the dimension is based on the fact that life goals traditionally vary between men and women. Men are more achievement oriented, while women more often see themselves in the nurturing role. However, in interpretation of this dimension, the most important characteristic is how the societies see the roles of males and females. Masculine societies like Japan and Austria are more achievement oriented; roles of men and women vary in those countries. Feminine societies (ex. Norway, Netherlands) place strong importance on relationships and equalize the roles of men and women.

Uncertainty avoidance (UAI) assesses how well the culture deals with uncertain situations: Do they try to resolve the uncertainty quickly or are they comfortable with uncertain situations? It should not be confused with risk avoidance. The countries with high uncertainty avoidance scores may actually take risks to resolve uncertainty quickly.

The long vs. short term orientation (LTO) dimension was added after the first four dimensions were already established and was examined on a smaller set of countries (only 23). Long-term relates to promoting values related to future rewards like frugality and perseverance, while short-term cultures are oriented toward present and past, placing most value on tradition and fulfillment of social obligations.

Although Hofstede's theory relates to social interactions, a number of researchers related the values represented in the dimension to visual communication. One of the most influential studies was conducted by Marcus and Gould (2000). Marcus and Gould related specific traits of each dimension to interface components including layout, navigation, interaction and image depictions. According to the researchers, the websites in high power distance countries would be characterized by symmetrical design, official seal and national emblems, photographs of leaders and monumental buildings. Table 1. provides the summary of the finding of following studies.

Table 1. Website characteristics in relation to Hofstede's dimensions of culture

Dimension	High	Low	Source
PDI	symmetry, tall hierarchies, focus on official seal and national emblems, photographs of leaders, monumental buildings,	asymmetry, shallow hierarchies, photos of students rather than faculty, images of both genders,	Marcus & Gould (2001)
	monuments	images of public spaces, images of everyday activities	Ackerman (2002)
IDV	images of individuals, images of young, emphasis on action,	images of groups, images of aged and experienced, emphasis on state being	Marcus & Gould (2001)
MAS	limited choices, orientation toward goals	multiple choices, orientation toward relationships	Ackerman (2002)
	emphasis on tradition and authority, frequent images of buildings,	frequent images of people, laughing, talking or studying together	Dormann & Chisalita (2002)
	graphics used for utilitarian purposes	attention gained by visual aesthetics	Marcus & Gould (2001)
UAI	limited choices, restricted amounts of data limited scrolling	variety of choices, long pages with scrolling	Marcus & Gould (2001)
	references to daily life, redundancy	abstract images	Ackerman (2002)
LTO		presence of a search engine	Robbins & Stylianou (2002)
	presence of flags, national colors		Ackerman (2002)

Websites in low power distance countries will most likely be symmetrical with photos of young people of both genders. Pictures on the websites in individualistic cultures will be more frequent than in collectivistic societies. In feminine cultures the graphics would be used to get viewer's attention, while in masculine societies they can be used for utilitarian purposes. High uncertainty avoidance would be characterized by

limited choices and scrolling. The list of cultural markers relating to Hofstede's dimension has been supplemented by Ackerman (2002).

Cultural markers have been also identified in several empirical studies. Robbins and Stylianou (2002) examined a number of commercial websites in several geographical regions, comparing frequencies of selected interface elements. Their study identified organizational charts, bios of company leaders and CEO messages as characteristics of high power distance countries, while listings of job openings and cookie disclosers would be indicative to high uncertainty avoidance. Individualism/collectivism dimension would be characterized by site registrations requirements and privacy policy postings and long/short term orientation would be indicated for example by the presence or lack of the search engine. Dormann and Chisalita (2002) examined how people from the Netherlands and Austria evaluate websites with different masculinity/femininity index. They concluded that subjects rated higher all the feminine values in feminine websites, but with regards to masculine values only authority and toughness were rated higher in homepages from masculine countries.

In general, empirical studies on the subject of applicability of Hofstede's theory to web design concentrate on a small number of cultures. The study by Marcus and Gould, although well grounded in Hofstede's theory, provides only selected examples, which raises the question if the theory is applicable on larger scale. Therefore, this study will attempt to apply their findings to a much larger sample and to examine if the graphical elements mentioned in the literature are indeed the marker characteristic for a specific dimension.

The popularity of Hofstede's theory in visual communication studies is not surprising, as his theory gained a great popularity in a number of disciplines and it has been cited over 3500 times (Callahan, 2004). However, his theory has also been heavily criticized[1], raising the question if it is indeed the best theory to be used in such studies.

Therefore, this research has a twofold goal: to determine the extent of cultural differences/similarities in web design and to attempt to assess the applicability of Hofstede's theory to interface design studies.

2. Methodology

2.1. HYPOTHESIS

Two principal questions guiding this research are: Does the design of the websites vary among countries and if so can the cultural differences in web design be measured by Hofstede's cultural theory? To attempt to answer those questions, a genre of university websites was chosen for investigation. This research was preceded by a pilot study (Callahan, 2005) that suggested that university website interfaces designed in different countries indeed have different characteristics, and that Hofstede's dimensions of culture can partially explain them. Considering that the pilot study included only the

[1] A review of Hofstede's criticism has been presented in the pilot study published in Journal of Computer Mediated Communication (Callahan, 2005).

countries on the high and low spectrum of each dimension, it is possible that they constitute outliers. Those limitations resulted in a need for a larger and more diverse sample. Based on the visual markers identified in the literature (compare Table 1), the following hypotheses were advanced:

In regard to the power distance dimension in relation to country scores:

H1. Frequency of symmetrically designed sites is correlated positively.

H2. Frequency of logos is correlated positively.

H3.Relative frequency of images of faculty is correlated positively Relative frequency of images of students is correlated negatively.

H4. Relative frequency of images of buildings is correlated positively. Relative frequency of images of people is correlated negatively.

In regard to individuals/collectivism dimension in relation to country scores:

H5. Relative frequency of images of individuals is correlated positively. Relative frequency of images of groups is correlated negatively.

H6. Relative frequency of images of students is correlated positively. Relative frequency of images of faculty is correlated negatively.

In regard to masculinity/femininity dimension in relation to country scores:

H7. Relative frequency of figurative images is correlated negatively. Relative frequency of images of buildings is correlated positively.

H8. Relative number of pictures of women is correlated negatively.

H9. Relative frequency of animated pictures is correlated positively.

In regard to uncertainty avoidance dimension in relation to country scores:

H10. Frequency of horizontal pages is correlated positively.

In regard to long-/short-term orientation in relation to country scores:

H.11. Frequency of search engines is negatively correlated negatively

H.12. Relative frequency of flags and national emblems is correlated positively.

H.13. Frequency of university related news is correlated positively.

The number of hypotheses in this study is rather large in comparison with other studies on this matter. There are two reasons for that. First, this study is undertaking a comprehensive comparison on the basis of a large number of variables, which dictates the number of hypotheses. Second, the number of hypotheses might be simplified by combining the hypotheses relating to the same dimension. However, considering that each of them relates to a set of negative or positive correlations, it would be difficult for the researcher and reader to keep track of the directionality of each correlation related to the compound hypothesis.

2.2. SAMPLE SELECTION

Since this study uses Hofstede's model of culture, it seems reasonable to use the same set of countries (50 +3 regions) as he used for his research. However, since his data was collected over thirty years ago, in some cases today's borders do not mirror those in the 1960s and 1970s. In this study universities from all parts of Germany were included in the sample (Hofstede's sample was based on West Germany only), and countries of

former Yugoslavia were combined for analysis. Several countries studied by Hofstede (Colombia, Guatemala, Hong Kong, Jamaica, Panama, Singapore, Switzerland and Uruguay) had to be eliminated from this study, since their total numbers of universities were too small for analysis. Thus, the sample for this study consists of 42 countries and three regions.

From each country, a sample of 20 university websites were selected from a comprehensive list of universities, complied on the basis of International Association of Universities database and lists posted on official governmental sites in chosen countries.

The compiled lists of the universities for each country and region were entered into a Microsoft Excel spreadsheet, and each university was assigned a number. The RANDBETWEEN function was used to randomly select 20 universities from each country. After an institution had been chosen, an attempt was made to find its website. The sites were checked to see if they satisfied the selection criteria (B.A. or higher). The data collection for the study started in February 2006 and continued throughout the year. In total, 900 web pages were examined and over 7,000 images coded and analyzed.

2.3. ANALYSES

Visual content analysis methods were applied to the home pages of each of the chosen universities. Because this study concentrated on finding cultural markers typical of specific cultures, only the pages in the cultures' native languages were examined (with the exception of when the website was in English only), especially since in some cases the English language pages were designed differently (and underdeveloped) compared to their native language counterparts.

The home pages were analyzed on the basis of two criteria: organization and graphical design. The categories for the analysis were established and operationalized on the basis of a small sample of sites before conducting the study. The categories were chosen according to the criterion of whether they can be examined empirically; they should also support, reject, or explain the results of the stated hypotheses. To ensure reliability of the categories, 10% of the sites (two sites chosen randomly from each country) were coded by two coders and the results were compared, using Krippendorff"'s alpha (Krippendorff, 2007).

The pages were categorized on the basis of their orientation (horizontal/vertical) and symmetry. The number of pages that included a search engines and pages with university related news were also counted for each county. Each image was analyzed and assigned to one of the following categories: logo, person, building, art, flag or other. The category description was decided on the basis of the foreground of the picture. Images of people were analyzed further according to the number (single, group), gender (male, female, mixed, unidentified), and status (student, faculty, mixed, unidentified). Logos were categorized in three subcategories: traditional (university seal), modern (artistic design), and alphanumeric (logos composed of letters and numbers). After the coding was completed, the frequencies of occurrence of each category were counted and compared across the countries. The frequencies for all countries in each category were correlated (separately) with Hofstede’s dimensions.

3. Results

The results of the analysis reveal a great diversity of design choices applied in different countries. Analysis confirms that countries around the world indeed vary in the ways they present their websites, answering the first research question in the affirmative. The second research question (Can those similarities and differences be measured using Hofstede's dimensions of cultures?) was confirmed only in the relation to the dimensions that had been also identified by other theorists, suggesting that the theory is limited in explaining cultural differences in visual communication

3.1. CULTURAL DIFFERENCES

3.1.1. Page layout

Comparing websites from chosen countries on the number of characteristics, one could see significant differences in the layout choices. Sites around the world varied significantly (at a level .001) in regard to page orientation (Chi-square=131.657), page length (Chi-square=124.692), structures of the menus (Chi-square=119.808), number of pictures (ANOVA F=2. 850), and presence of a search engine (Chi-square=119.420). However some similarities could also be identified. Most of the pages were asymmetric regardless of country. Only a small number of sites (13.5%) showed some vertical symmetry. 78% percent of sites were centered on the page (that included sites that spread on the full length of the window.)

More detailed analysis of each characteristic shows country preferences in choices of design elements. For example, horizontal pages were more frequent (58%) than vertical pages in general; however, preferences varied significantly among countries. The vertical pages were most common in the Philippines, Thailand, Brazil, and Argentina, while the U.S., Korea, and Australia preferred horizontal design. All sites in Israel were horizontal. Israel, Australia, Korea, and Great Britain preferred short pages, while pages in Indonesia, Yugoslavia, the Philippines, Taiwan, and Thailand were considered long.

Navigation on most sites was handled by simple menus. Complex roll-down menus were present on 32.6% of the sites, most commonly in South Korea (16), Turkey (13), Israel (12), Peru (11) and Canada (11). Simple menus were preferred in almost all other countries, especially in some European countries, Australia and West Africa. Sweden did not record a single complex menu.

Search engines were present on 40% of the sites. The U.S., Great Britain, Australia, Norway, and Iran had search engines on most of their sites. In contrast, search engines were not popular on the websites designed in Arab Countries, Belgium, Costa Rica, Ecuador, India, Pakistan, Peru, West Africa, or Yugoslavia. 4.3.1.7 Number of pictures

Considerable differences were evident in the number of pictures across countries. Ireland with 67 pictures total and Thailand with 223 were on opposite ends of the spectrum.

3.1.2. Depiction

Great differences were recorded in preferences for the depiction presented in the images. Several categories of depiction (logo, person, building, other) were identified. The differences in the depiction choices are significant at a level 0.000, with Pearson Chi-square equaling 1086.262, and 176 degrees of freedom.

Almost all universities, regardless of country had some type of logo on their pages. The total number of logos was 1022 accounting for 14.45% of all images. With the exception of Austria, Belgium, Denmark, Germany, Great Britain, Israel, Japan, Malaysia, Netherlands, and the U.S., all sites had at least one logo on the page. Mexico, Arab countries and El Salvador had the most logos. Logos were usually located in the left upper comer and sometimes repeated in a smaller form at the bottom of the page. Therefore, it seems that the idea of a logo as an institutional identifier is universal and the possible cultural differences will be more visible in the type of the logo or its depiction.

People were the subject in a total of 3068 images and were the most frequent depiction in most of the countries, with the exception of Arab Countries, Iran, West Africa, India, the Philippines, Spain, Ecuador, and Greece, where images of buildings were more common. These preferences might be explained by religious preferences - Islam discourages representations of Allah and the Prophet, so perhaps presentations of persons will be less likely. However, the relatively small numbers in Catholic Spain and Ecuador are rather surprising. Although Greece did not have many photographs of people, figurative art was a very popular subject.

Most images portraying people showed groups of people (61.15%). The highest number of images of groups was in Iran, the Arab Countries, Pakistan, Japan, Taiwan, and Indonesia Portraits of single individuals were most common in Great Britain, the Netherlands, Australia, and New Zealand.

With regard to gender, pictures portraying a single gender were most common (51.8%). In 9.9% of images, the gender of the subjects could not be determined. These included mostly artistic photos showing just a part of human body (infrequent), or more commonly, small pictures with low resolution, where recognition of the subject's gender was impossible. Iran (30%), Argentina (26.4%), Indonesia (24.3%), West Africa (22.7%), Taiwan (21.6%), and India (20%) had the highest percentages of low resolution pictures with unrecognizable gender.

Among single gender pictures, no differences were noticed in gender preferences overall. Hence, among single gender pictures, men (50.98%) and women (49.02%) were both equally likely to be subjects of the pictures. However, one could see that the preferences varied greatly among countries. Iran, Turkey, Pakistan, Costa Rica, Arab Countries, Yugoslavia, and Indonesia recorded fewer than 30% pictures of women. Interestingly, as reported earlier, those countries tend to have fewer images of people in general. None of the countries had fewer than 30% of male images, although Ireland (30%), Taiwan (31.25%), and Austria (31.82%) come close. Although it has not been studied in detail, it seems that in the countries where images of people were common, there was a tendency to deliberately include both genders equally.

Most of the images (62.5%) on the university websites are of students. The pictures show students posing for pictures, studying, working on their projects or involved in sport activities. Graduation was also a common theme. Since web pages are

the virtual front gate to the university, the images shown are mostly of happy, active and engaged students, with a few exceptions. For example, one website showed a picture of a student asleep over his books.

Images of professors, usually portraits or group pictures of university senates, accounted for 11.3%. Slightly over 10% of the images showed students and professors together. In some countries, they are usually posing for group pictures, while in others faculty and students are involved together in academic activity, such as working on projects. In some cases, those pictures show an instructor conducting a class. Turkey (27.6%), Pakistan (23%), India (20%), and Thailand (19.2%) had the highest percentages of images of people other than students and faculty. This was especially visible in the case of Thailand, which had overall the highest number (29) of images in this category, usually showing the Thai king Bhumibol Adulyadej (Rama IX).

Examining pictures of students and faculty, one can notice that their major goal is to present the universities from two distinctive perspectives. The pictures with students studying or posing in their graduation photos and professors portrayed in authoritative roles present universities as a place where education is viewed as gratifying. Pictures with smiling students engaged with faculty suggest that those societies perceive education as an enjoyable process.

The architectural splendor of the campus was the second most common theme of the images. Almost 20% of all images (1409 images) focused on architecture. The images presented both traditional architecture and modern buildings. The traditional architecture makes the viewer reflect on the tradition of the university and its reputation. Very modem buildings emphasize progress and make the site visitor think about the future. The modern architecture also frequently displays special resources of the university.

A substantial number of images (17.4%) fell into the Other category. Examples in this category include computers, books, art, pens, musical instruments, and other objects commonly used by students.

3.1.3. Correlations with Hofstede's dimensions

While cultural differences in web design have been noted, they did not seem to fully fall into Hofstede's dimensions. Out of the 13 hypotheses, five were confirmed, two were partially confirmed, and six were rejected. Interestingly, the confirmed hypotheses relate to two of Hofstede's dimensions: power distance and individualism/collectivism. Table 2 below summarizes the results of the study. However, the confirmed correlations vary from weak to moderate.

The first comparison, the positive correlation between page symmetry and power distance index, was weak and not statistically significant. Therefore, the first hypothesis was rejected. This is not surprising, considering that symmetrical pages were not very popular in general and constituted only 13.5% of all sites. The next three hypotheses also relate to the power distance dimension. Frequency of logos was correlated positively with power distance, as hypothesized, although Mexico with a high of 44 logos strongly influences the results. The correlation was even greater and more significant when only traditional logos were counted (identified in Table 2, in parenthesis). It was also observed that traditional liberal arts universities were more likely to have traditional logos, while technical and art universities would use more

contemporary designs. This may also relate to the age of the university, although this is merely a speculation. These two observations raise an additional question: Is it possible that high power distance cultures will more likely have more traditional liberal arts universities, while low power distance cultures will have more technical schools?

Images of faculty were more frequent in high power distance countries than in low power distance countries, and this trend was reversed in the case of images depicting students. Arab countries were an outlier in the faculty category, mostly due to the fact that images of people in general were highly infrequent in those countries. When pictures that depicted both students and faculty together were added to each group (compare Table 2, in parenthesis), the correlation strength and significance level increased for faculty and decreased for students. There were some noticeable differences in the way the faculty was portrayed in different countries that would require further investigation. Some countries had more images of faculty as authority figures, e.g., a portrait accompanying an ex cathedra message or an image of faculty in full regalia, sending a message to the students that the knowledge they acquire comes from erudite and respectable sources. Other countries were more likely to show faculty teaching or working with students on research projects, emphasizing the accessibility of the teachers. These distinctions should be taken into consideration in future studies dealing with power distance and faculty images.

A positive correlation with buildings was hypothesized on the basis of another assumption stated by Markus and Gould (2000). Monumental buildings have been used to signify power in countries around the world throughout the ages. As in the case of logos, the correlation between high power distance and buildings raises the question: Are high power distance countries more likely to show buildings, believing that impressive edifices are more representative of the university than images of students and faculty, or are those countries more likely to have architecturally intriguing buildings to display? Although answering this question fully is beyond the scope of this study, it seems that the preference for displaying architecture is not related to the actual artistic values of the buildings, since some universities have campuses that are not necessarily attractive. University of Azad Jammu & Kashmir even presented buildings damaged by an earthquake.

Correlations of design elements with the individual vs. collectivism dimension are greater, albeit still not strong. Individualism vs. collectivism is one of the dimensions recognized by Trompenaars and Hampden-Turner (1997), which suggest that this dimension is the most characteristic among the various different indexes classifying culture. Images of individuals were more common in individualistic societies, as predicted, while images of groups were more common in collectivist societies. The analysis of the scatterplots confirmed that the existing correlation is due to the positive relationship between variables and is not affected by outliers.

The frequent presence of group photos in collectivist countries has already been observed in a number of studies; therefore, this correlation is not surprising. Images of students were also correlated positively with individualism. The images of faculty were correlated negatively, but the correlation was only significant when the numbers also included images showing faculty and students together (Table 2, score in parenthesis).

The hypotheses related to the masculinity/femininity dimension were not supported, with the exception of a modest positive correlation with the images of

buildings. This correlation can be explained by the fact that architecture has historically been created by men. Thus, this representation of achievement would indeed be more characteristic of masculine societies. It was assumed that one of the foremost characteristics of this dimension would be lack of images of women in countries with a high masculinity index (not confirmed). The lack of hypothesized prevalence of female photos in the countries described as feminine can be explained simply by the observation that the masculinity vs. femininity dimension relates to the characteristics associated more frequently with a specific gender and does not relate to gender preferences. Therefore, this assumption made by HCI researchers studying Hofstede's dimensions may not hold.

Table 2. Correlation coefficients for research hypotheses

Cultural Dimension	Hypothesis	Pearson r Coefficient
Power distance	H.1 - Frequency of symmetrical homepages correlated positively	.277 (.258)
	H.2 – Relative frequency of logos correlated positively	**.325* (.392)****
	H.3 – Relative frequency of images of faculty correlated positively, relative frequency of images of students correlated negatively	**.362* (.413)**** **-.416** (-.354)***
	H.4 – Relative frequency of images of buildings correlated positively, images of people correlated negatively	**.374*** **.-.427****
Individualism/ Collectivism	H.5 – Relative frequency of images of individuals correlated positively, images of groups correlated negatively	**.576**** **-.576****
	H.6 – Relative frequency of images of students correlated positively, images of faculty correlated negatively	**.550 **(.496)**** -.264 **(-.336)***
Masculinity/ femininity	H.7– Relative frequency of figurative images correlated negatively, relative frequency of buildings correlated positively	-.206 (-.195) **.346***
	H.8 – Relative frequency of pictures of women correlated negatively	-.163
	H.9 – Relative frequency of animated pictures correlated positively	.038
Uncertainty avoidance	H.10- Frequency of horizontal pages correlated positively	-.135
Long term orientation *	H.11 - Frequency of search engines correlated negatively	.059
	H.12 - Frequency of flags correlated positively	.084
	H.13 - Frequency of news correlated positively	**.534****

* p < .05, ** p <. 01

Since two of the hypotheses relating to uncertainty avoidance were excluded from the main investigation, only the correlation of horizontal versus vertical pages with UA

was researched. A weak non-significant correlation was noted in the direction opposite to that hypothesized. As stated previously, uncertainty avoidance may be achieved in two ways: by avoiding situations that may lead to uncertainty or by actively working to prevent uncertain situations from occurring. This bipolar characteristic of the dimension may be responsible for the directionality of the correlation.

The hypotheses for long-/short-term orientation were also not supported, with the exception of news being frequent in long-term oriented countries. The correlations between long/short term index (LSO) and the number of pages with search engines, as well as between LSO and the number of flags and national emblems, were practically non-existent and not significant. The lack of correlation between LSO and flags is not surprising, considering that those images were not very frequent (56 for the entire sample). Additionally the case of Thailand, with its unusually large number of national emblems (16), distorted the calculations. We can conclude that national emblems should not be used as representative of a specific dimension, but rather are specific to a particular country. Possibly in countries where the government influence on the university education is greater, the presence of national symbols will be more common than in countries with a large number of private, independent universities.

A moderate and statistically significant correlation at α level .01 was noted between the LSO index and the presence of news. However, more detailed observations of this feature raise yet another question. Examining websites in countries where English is the language of the site, one might notice that the news could fall into two categories: news related to recent past events and announcements that inform about upcoming events. Comparing these two categories with the descriptions of long- and short-term oriented countries, it seems reasonable to assume that countries with long-term orientation that place importance on the past and the present will more likely have news related to past events, while countries with short-term orientation will be more oriented toward upcoming events.

The results of the correlations suggest that Hoftede's theory is rather limited in explaining the cultural differences in visual communication, and that the differences in design go beyond a strict set of categories. Therefore, researchers should not base their solely on Hofstede's theory, but the studies should aim at developing alternative theories directly related to visual communication in cultural context. Considering that the results of this study show less support for Hofstede's theory than the pilot study conducted several years ago, it is possible that intercultural influences on the web are becoming stronger over the recent years.

4. Conclusions

This study started with the assumption that because cultural differences are visible in various aspects of human communication, they will also be visible in interface design. This research confirmed that some differences in interface design exist among cultures, although some of them are not as pronounced as hypothesized. Moreover, there are a great number of similarities among the designs.

Two website characteristics that were similar across countries were asymmetrical design and centralization of the design. A detailed analysis of the page layout is beyond

the scope of this study, but analyzing such a large number of sites reveals that the sites tend mostly to follow one of three schemes: (1) a large picture, often off center, with a number of links on the page, (2) left-top menu design with information in the middle, (3) or information organized in columns. In most of the sites, the symmetry was outbalanced on purpose for artistic effect or to designate specific areas of the screen for different types of information, especially news, which has recently become popular on many sites.

The presence of news (some updated daily) on the sites was much greater than expected. The news were more frequent than in previous years. This trend for news to be included on university web pages will probably continue, raising not only questions of whether the site provides news or not, but how frequently news items are changed and how current they are.

The fact that most pages are centered is not very surprising, considering that even in print media central positioning of the text is standard. Use of full size screen is probably due to the fact that most sites, regardless of region, are third-generation interfaces designed using techniques that allow easy repositioning of elements to accommodate users' screen dimensions. The hypothesis regarding central design stated in this research was based on literature that is several years old. Given the rapid changes in design technology, this literature may no longer be valid.

The similarities in design can be attributed to two factors: shared technology and shared design practice. As mentioned previously, today's designers have an array ofweb design tools to create highly interactive sites. The same effect can be achieved using many different methods, and without detailed analysis of the source of the HTML coding, it is difficult to assess if a certain technology is favored in a specific country.

Shared practices in design are not a new concept. The design of newspapers and other printed media in various countries have some similar characteristics. This is due to the fact that specific media have their own cultures. The global shared culture of the Internet (as a medium) may be even stronger, because the Internet is a truly international medium in that it is not owned by a particular country, and once information placed on the net, it is visible to almost everyone who has access to it at that time. Therefore, it is possible that Internet culture overrides national culture to the point that cultural differences in university websites are not strongly evident.

Analyzing the results of this study, one can notice that some similarities like depictions of students and faculty, images of campus, and university-related news are shaped by university culture, while the differences in frequency of such features are related to national culture. Some characteristics such as icons of national flags and the usage of national colors are directly related to national culture.

The differences in web design observed in this study show two distinctive trends. First, in several cases of hypothesis testing, the significant differences were due to the fact that one of the countries showed a strong preference for a specific characteristic, such as reloading pictures (U.S.) and national emblems (Thailand). Second, some design characteristics (like animation) are considerably more common in certain geographical ethnic/linguistic regions. Those observations may be the result of a specific characteristic of the Internet as a medium: its global accessibility. It should be kept in mind that accessibility does not equal access. The fact that information is available on the web and accessible from all around the world does not necessarily

mean that a particular site is visited by designers from far away countries. It is probably safe to assume that if designers are looking for inspiration for their design solutions, they will first visit other sites in their own country and possibly other sites in countries from the same linguistic group. Therefore, despite the fact that many of the design solutions can be adopted from other sites, it is possible that similar ideas circulate more on a regional than a global level.

At the same time, it is important to bear in mind that culture may not be the only source of variation in web design. Content analysis of graphical elements does not allow us to determine who the designers are, what motivated their choices, etc. In particular, we need to ask whether they were influenced by the design of other university websites or required to follow institutional guidelines in promoting their university's image. It is also possible that the availability of online tutorials and online webmasters' discussion groups may have influenced the ideas represented in the designs. Economic factors could also play a role; poorer universities and regions may not be able to acquire more sophisticated web development software or have a highly trained web design staff. This last possibility did not seem to be true for the sites studied here. For example, Latin American countries are less prosperous than Scandinavian countries, but sites from Latin America had heavily animated pictures and text, while Northern-European sites strove for simplicity. Likewise, the African sites ranged in complexity from amateur to highly professional.

Finally, it should not be forgotten that the most important questions about culture and web design must be asked from the perspective of the user: Do the cultural differences evident in graphical design influence website usability? Do the people from the countries from opposite poles of Hofstede's dimensions prefer websites with widely divergent designs, and more importantly, do they perform better on interfaces designed specifically for their culture? These questions point to the need for further studies to examine users from other cultures, their expectations and needs, and their aesthetic preferences.

5. Limitations of the Study

The main investigation corrected one of the limitations of the pilot studies: a small number of countries. However, several limitations still remain. First, the study researched sites in only one genre, university websites. This design of the study helped establish valid comparisons but also influences the results. For example, since the clients of universities are mostly young people regardless of country, it is natural that they will be a frequent subject of images. This limitation could be overcome by conducting studies of different web genres. Second, the study was limited to 20 sites per culture, which is a limitation difficult to overcome since some countries do not have more than 20 universities or universities with websites.

A further limitation is the fact that the study analyzed only graphical elements. The literature suggests that cultural differences are also evident in language and discourse styles (Marcus & Gould, 2000; Rajkumar, 2003). However, textual studies can be conducted only by people with a native or close to native knowledge of the languages used, and require an expertise of a group of researchers. Hopefully, more

studies on this topic will be conducted in the future, which will help create a foundation needed to answer questions regarding what impact modern technologies have on intercultural exchange of ideas for information organization and design.

References

Ackerman, S. K. (2002). Mapping User Interface Design to Culture Dimensions. Paper presented at International Workshop on Internationalization of Products and Systems, Austin TX, USA. Retrieved May 20, 2002, from http://www.iwips2002.org/downloads/AMA_XCult_13Jul02.ppt

Barber, W., & Badre, A. (1998). Culturability: The Merging of Culture and Usability. Paper presented at 4th Conference on Human Factors & the Web, Baskin Ridge NJ, USA. Retrieved April 30, 2000, from http://www.research.att.com/conf/hfweb/proceedings/barber/

Callahan, E. (2004). Interface design and culture. *Annual Review of Information Science and Technology*, 39, 257-310.

Callahan, E. (2005). Cultural similarities and differences in the design of university websites. *Journal of Computer-Mediated Communication*, 11(1), article 12. http://jcmc.indiana.edu/vol11/issue1/callahan.html

Choong, Y. Y. & Salvendy, G. (1998). Design of icons for use by Chinese in mainland China. *Interacting with Computers*, 9, 417-430.

Dormann, C., & Chisalita, C. (2002). Cultural values in web site design. Paper presented at ECCE-11: Eleventh European Conference on Cognitive Ergonomics, September 8-11, 2002, Catania, Italy. Retrieved February 10, 2003, from http://www.cs.vu.nl/~claire/Hofstede-dormann.pdf

Hofstede, G. (2001). *Cultures and organizations: Software of the mind*. London: McGraw-Hill.

Krippendorff, K. (2007). Computing Krippendorff's Alpha-Reliability. Unpublished document. Retrieved February 10, 2007 http://www.asc.upenn.edu/usr/krippendorff/dogs.html

Marcus, A., & Gould, E. W. (2000, June 19). Cultural dimensions and global Web user-interface design: What? So what? Now what? In *Proc. of the 6th Conference on Human Factors and the Web*, June 19, 2000. Retrieved June 15, 2001, from http://www.amanda.com/resources/hfweb2000/hfweb00.marcus.html

Rajkumar, S. (2003) University Web sites: Design differences and reflections of culture. Unpublished manuscript, School of Library and Information Science, Indiana University, Bloomington.

Robbins, S.S., & Stylianou, A.C. (2002). A study of cultural differences in global corporate websites. *Journal of Computer Information Systems*, 42, 3-9.

Russo, P., & Boor, S. (1993). How fluent is your interface? Designing for international users. In *Pros. INTERCHI '93*, ACM Press, 342-347.

Trompenaars, F. & Hampden-Turner, C. (1997). *Riding the waves of culture*. 2nd Edition. London: Nicholas Brealey.